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NAME OF THE STEELHEAD

The name, *Salmo gairdneri* Richardson 1836, was regarded by Jordan and Gilbert in the fishery explorations of 1880 and subsequently as applying to the Columbia River Steelhead, which is a sea-run trout.

This name is older than *Salmo irideus* Ayres, given to the brook form of California. But in the shore streams of California the steelhead and brook trout are of the same species. Whether steelhead and trout in the lower Columbia are identical with the California form is still uncertain. In any case the name *Salmo gairdneri* cannot be used for any trout, being first applied to one individual of the blue-back salmon or Sockeye *Oncorhynchus nerka.* Dr. Richardson expressly states that his type had 64 vertebrae, the number found in *nerka.* The steelhead has but 58. No species of *Salmo* so far as known has over 60, and no Pacific Salmon (*Oncorhynchus*) less than 64 to 69.—DAVID STARR JORDAN, *Stanford University, Calif.*

THE NAME OF THE DOLLY VARDEN TROUT, *SALVELINUS SPECTABILIS* (GIRARD)

The Dolly Varden Trout or Bull Trout, the char of Northern California and northward, has, so far as observation goes, the head longer than in the red-

spotted trout or char of Alaska, *Salvelinus malma* (Walbaum). In Columbia River examples, the head is more than one-fourth the standard length (to base of caudal); in Alaska examples, less than one-fourth.

The earliest scientific name of the Dolly Varden is *Salmo spectabilis* Girard. This name was set aside by Jordan and Evermann because of the earlier *Salar spectabilis,* Cuv and Val. But the two fishes belong to different genera, and the combination *"Salmo spectabilis,"* had not been used before Girard. If the species is distinct from *Salvelinus malma,* the name *Salvelinus spectabilis* must stand, replacing *Salvelinus parkei.*—David Starr Jordan, Stanford University, Calif.

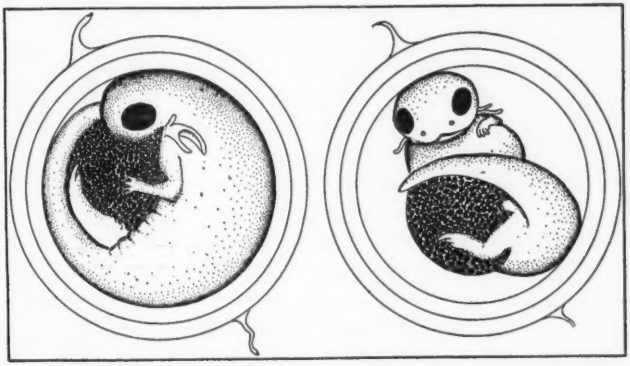
EGGS OF BATRACHOSEPS ATTENUATUS

On March 14, 1922, Mr. H. C. Dreier of Palo Alto, California, found a Slender Salamander, *Batrachoseps attenuatus* (Eschscholtz), with some eggs of the species. The eggs were with the parent in a small pocket beneath the surface of the soil in his garden. This is but the third time within the writer's knowledge, that eggs of this salamander have been reported, although the species is abundantly represented in the foot-hill region near Stanford University. Dr. C. V. Burke mentions the first discovery of the eggs of this species in The American Naturalist, Vol. XLV, July, 1911, page 413.

The eggs which came into the hands of the present writer were in the form of very firm, gelatinous globules, securely attached, one to another, much like loosely strung beads.

Each egg measured 6.3 millimeters in diameter. The capsule was almost perfectly transparent and of a pale amber color. When placed in water and viewed by transmitted light, the embryo appeared

to be enclosed by two distinct capsules, one within the other. The outer, when dissected away, was dense or rigid enough to maintain its globular form. Its substance was amber-colored, whilst the capsule within was colorless. Extending from each pole of the outer capsule was a filament by which it was attached to the adjoining egg. The filament did not appear to be hollow. The inner capsule could not be made to revolve within the outer one, although the two readily separated.



Egg capsules and the enclosed embryos of *Batrachoseps attenutus*

The embryo could be observed through the second capsule as clearly as if it had been embedded in optical glass. It was curled about a large straw-colored mass of yolk, the tail passing to one side of the head in one case, a little below and posterior to it in another. At this time the legs were well developed and large trilobed gills were present. It will be recalled that *Batrachoseps* is terrestrial, and is never seen in the water. It could not be determined whether the gills were functioning as organs of respiration.

The second enclosing capsule was dissected away, but unlike the first one, it fell into a shapeless mass.

It was removed with difficulty, being very elusive, easily evading the edge of the scalpel. It was now seen that the embryo was within still another capsule, the substance of which was very viscid and adhered closely to an inner membrane. When the latter was laid bare it quickly shrunk as if a contained fluid had passed out, compressing the embryo from all sides into the least possible space. When the membrane was ruptured the body of the embryo straightened out like a released spring.

At the stage here described the embryo measured about 10 millimeters in length. When it grew to about 13 millimeters, and the yolk mass was considerably reduced, the gills were much shortened. Later, when the embryo was about 16 millimeters long and the remnant of the yolk, enclosed within the body, was just visible through a long abdominal slit, the gills had nearly disappeared. Shortly after this, April 3, one salamander hatched. It measured 16.5 millimeters. No gills were visible.

The writer has not observed the slender salamander burrowing in the ground, certanly not after the manner of the earthworm, as alluded to by Dr. Burke.—J. O. Snyder, *Stanford University, Calif.*

SPERMATOPHORES OF DESMOGNATHUS FUSCA

So little seems to have been published concerning the mating habits of any of the Plethodontidae that this somewhat delayed report is offered, not so much for its own value, as by way of calling attention to the lack of knowledge of the subject in the hope that in the spring of the year which is undoubtedly the mating season of many of this family, other investigators may be stimulated to make and report further observations.

In 1913 the writer reported in an account of the Life History of *Desmognathus fusca* (Biol. Bull.

XXIV) a single observation of an actual mating in this species. This mating took place under purely terrestrial conditions in a terrarium in the laboratory. From this it appeared that the spermatophore was transferred directly from the cloaca of the male to that of the female, a method wholly consistent with the terrestrial egg-laying habit of the species.

I compile the following from notes made by me about two years after the above-mentioned account was published. On May 14 to 16, 1915, there were collected from Bears' Den Brook on Mount Toby in Sunderland, Mass., several adult *Desmognathus fusca,* some very large, others smaller, and a few very small ones. Ten or twelve of these were kept unassorted in shallow water in a covered glass crystallizing dish until May 20, when it was observed that in the water, which looked rather foul, there were several creamy white masses of irregular shape, measuring about one millimeter in diameter. These proved upon microscopic examination to be masses of spermatozoa constituting poorly formed spermatophores. One rather small individual which was assumed to be a male, showed such a mass protruding from its cloaca. This specimen was at once removed from the dish and placed with three large gravid females in another dish of water for further observation. A few hours later the spermatophore unfortunately became detached by adhering to the moult layer which the animal was in the act of casting off. This individual was, however, left with the three females until July 1, when upon being killed and examined, it was found not to be a male but a female with half-grown eggs, and with empty spermatheca. Obviously, then, the spermatophore which had been observed protruding from its cloaca on May 20, had been taken up by the animal, though unsuccessfully, owing to the fact of the moulting process which was in progress. Whether this spermatophore had been taken up from the water, or

had been transferred to the cloaca of the female directly from the cloaca of one of the males, is a matter which, of course, cannot be determined, but the presence of so many spermatophores in the water suggests the probability that the spermatophore had been taken into the cloaca of the female after having been deposited in the water by the male, as is the usual method in internal fertilization under aquatic conditions. If such be the case, it is probable that both the direct and the indirect method of impregnation of the female obtain in this species, the former operative when the individuals find themselves under purely terrestrial conditions, the latter, which is of course the more primitive method, being employed under aquatic conditions. In any case the fact that a spermatophore was found in the cloaca of an unripe female shows that impregnation may occur long before the actual ovulation, although it does not prove that these same spermatozoa would have remained functional until egg-laying occurred.

In connection with the above report, certain observations which I made subsequently upon the activity of spermatozoa of *Desmognathus fusca,* may be of interest. I took living spermatozoa from various regions of the ductus deferentia of a number of individuals and examined them microscopically both in normal salt solution and in water. In the normal salt they exhibited much activity, swimming in wide spiral curves, whole masses moving in parallel courses. This movement was continued in the normal salt solution so long as drying did not occur. The movements of the undulatory membrane were plainly visible under a Leitz Objective 8, Ocular 3.

On the other hand, when mounted in water for examination they soon ceased their wide-sweeping swimming movements, the undulatory membrane became inactive and by a series of jerky, springing movements each spermatozoon rapidly became coiled about the corpuscular mass which is located near the

free end of its tail, thus assuming eventually a more or less loosely coiled position.

In my published description of the living spermatozoa taken from the cloaca of a female under wholly terrestrial conditions, the characteristic tightly-coiled condition was described, whilst it was found that these tightly coiled sperm when placed in water slowly uncoiled by mechanical jerks but exhibited none of the characteristic free swimming activities which had been observed by me in sperm taken from the ductus deferentia. Some of them even remained tightly coiled in the water for a considerable time and all tended to coil up again as the water was allowed to dry out.

It would seem from these observations that when the spermatozoa are transferred directly from the cloaca of the male to that of the female, they undergo somewhere during the transfer a sufficient amount of drying to insure the tight coiling of each sperm so that they form together a fairly compact mass of spermatophore for storage in the spermatheca of the female. They probably resume their active swimming movements in due time within fluids secreted by the female. In the case of the deposition of spermatophores in the water, if indeed such a process normally occurs, the spermatozoa would cease their active swimming and undergo at least a partial coiling, sufficient to enable them to hold their position within the mass which is, however, much less compact and firm than when transferred under dryer terrestrial conditions directly into the female cloaca. Presumably such loosely formed aquatic spermatophores must be taken up very promptly by the female and may subsequently, when she goes out of the water, undergo further drying and thus become sufficiently compact to be stored in the spermatheca. This suggestion of a range of variation from an aquatic mode of internal fertilization to a terrestrial one, is exactly what might be expected in the case

of a species which has obviously only recently become terrestrial in its egg-laying habit. The superiority of the terrestrial mode of direct impregnation is obvious, and would naturally tend to become the usual one.

One other observation only appears to have been reported concerning spermatophores of any of the Plethodontidae, and this was to the effect that the male *Geotriton fuscus* (*Hydromantes italicus*) deposited spermatophores upon the ground in a terrarium in October (Von Bedriaga, Bull. Soc. Imp. Nat. Moscow, N. S. X, p. 249, 1897). With this paucity of knowledge of the method of mating of so large and important a family of Salamanders, a family which presents a range of habitat from the thoroughly aquatic of such forms as *Desmognathus quadrimaculatus* and *Leurognathus marmorata,* to the wholly terrestrial of *Aneidas lugubris, Hydromantes italicus,* and *Oedipus adspersus,* it is evident that further and more detailed observations of mating phenomena among these forms would be well worth while.—Inez Whipple Wilder, *Smith College, Mass.*

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